

PALOMAR ENERGY PROJECT (01-AFC-24) CEC STAFF DATA REQUEST NUMBER 4	
Technical Area: Air Quality	Response Date: April 8, 2002

REQUEST:

Please demonstrate that cooling tower PM₁₀ emissions are conservatively estimated by providing a discussion and references to documentation supporting the assumption that 50 percent of the TDS are PM₁₀. Please also provide information demonstrating that the SDAPCD and U.S. EPA have verified this assumption. If this information cannot be provided, please reassess impacts assuming 100 percent of the TDS are PM₁₀.

RESPONSE:

A number of recent projects have been permitted with PM₁₀ to TDS ratios of 50% and lower. These include the High Desert Power Project (permit revision) at 50%, Mesquite Generating Station (in Arizona) at 31.5% and the Blythe Energy Project at 15%. In a November 1, 2001 email sent to the Maricopa County Environmental Services Department related to the recent permitting of the Arlington Valley Energy Facility (AVEF), the EPA (Scott Bohning) stated that "I am comfortable with the 50% figure, " but he wanted to obtain further feedback before accepting the lower levels proposed by the AVEF project.

In support of the Blythe Energy Project, a technical paper (Attachment 4-1) was written and presented at the 94th Annual Air & Waste Management Association's Annual Meeting (June 2001). Based on the information and methodology presented in this paper, a PM₁₀ to TDS ratios of about 46% was derived as shown in the following calculations. Therefore, the 50% used for the Palomar project is supported empirically, is a level accepted by EPA, and is consistent with other projects approved by the Energy Commission and other agencies.

CALCULATIONS AND COMPUTATIONS

Project: Semptra Palomar

Project Number: 06205-011-150

Computed by:

M. Griffin

Date: 4/3/2002

Subject: Cooling Tower Emissions

Checked by:

Date:

Water Circulation Rate (a), 7 cells	(GPM)	130,000
Total Liquid Drift (b)	(%)	0.0005
Expected TDS/TSS of Circulated Water (c)	(ppmw)	4,000
Emission Rate - Total Cooling Tower		
Total Suspended Particulate (d)	(Lbs/Hr)	1.3
	(Tons/Yr)	5.7
PM-10 (e)	(Lbs/Hr)	0.6
	(Tons/Yr)	2.6
Emission Rate - Per Vent (f)		
Total Suspended Particulate	(Lbs/Hr)	0.19
	(Tons/Yr)	0.8
PM-10	(Lbs/Hr)	0.09
	(Tons/Yr)	0.38

Notes:

(a) Design Water Circulation Rate, Gallons/Minute (GPM)

(b) Design Total Liquid Drift, Percent (%)

(c) Process Design Data

(d) Based on USEPA AP-42 Section 13.4 Wet Cooling Towers, Table 13.4-1. Modified to Cooling Tower Design

$\text{Lbs/Hr} = (\text{Water Circulation Rate, GPM}) \times 60 \times (\text{Drift, \%}) / 100 \times$

$(8.3453 \text{ Lbs/Gal}) \times (\text{TDS, Lbs PM/1,000,000 Lbs Water})$

$\text{Tons/Yr} = (\text{Lbs/Hr}) \times (8,760 \text{ Hrs/Yr}) / (2,000 \text{ Lbs/Ton})$

(e) PM-10 based on ~46% of TSP. Assumed that PM-10 generated by water droplets with a diameter of less than ~87 microns which account for 46% of emitted from typical cooling tower.

(f) Cooling tower has seven cells. Each emits 1/7 of total tower emissions.

CALCULATIONS AND COMPUTATIONS

Project: Sempra Palomar
 Project Number: 06205-011-150
 Subject: Cooling Tower Emissions

Computed by: M. Griffin

Date: 4/3/2002

Checked by: 0

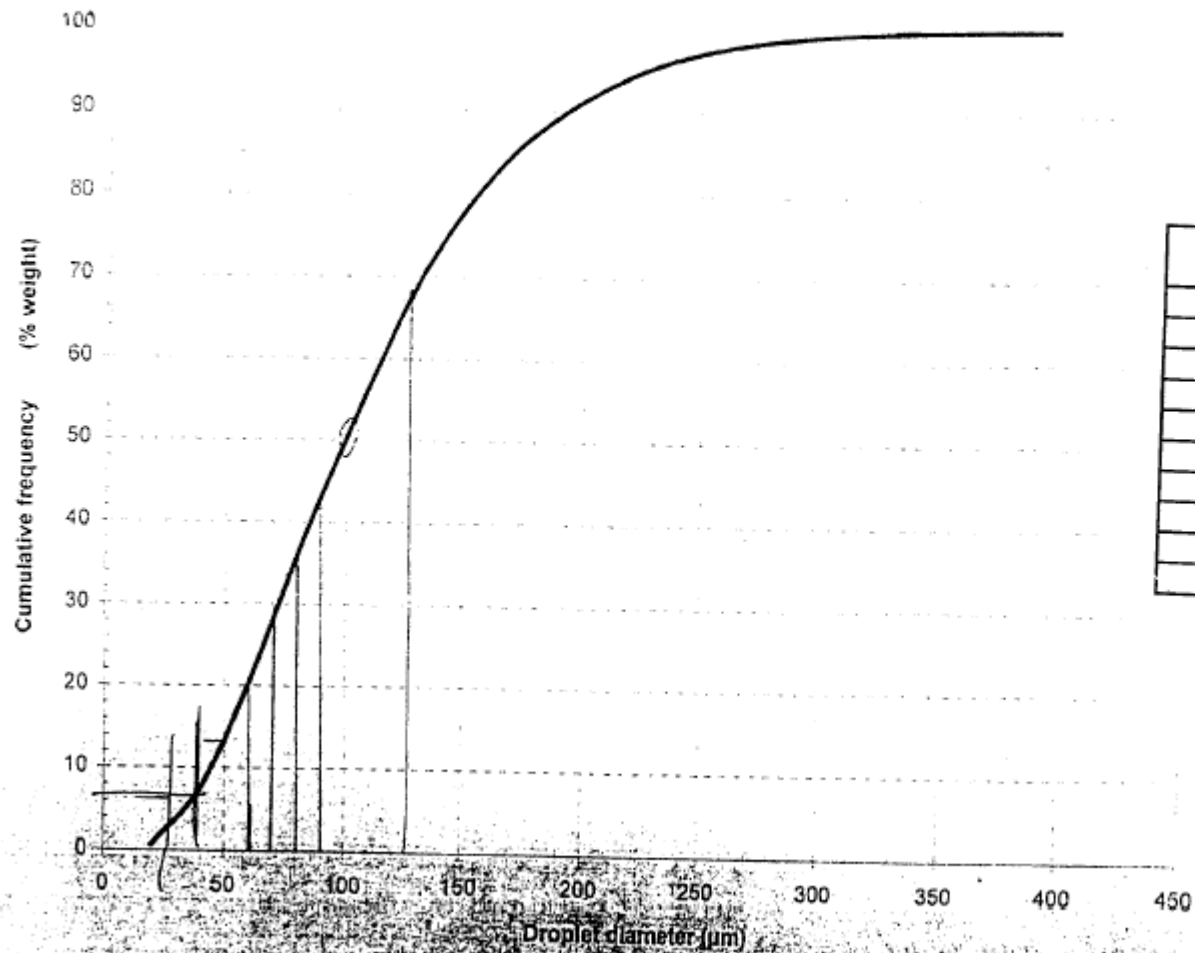
Date:

Calculated Particulate Size for Typical Cooling Tower Drop Size Distribution

Typical Cooling Tower				
Droplet Size				Particle Size
Mean		Distribution		
(Dd, Microns)		(% Mass Smaller Than)		(Dp, Microns)
20			0.000	2.4
35			13.000	4.3
62.5			34.000	7.6
87.5			50.000	10.7
112.5			66.000	13.7
137.5			78.000	16.8
175			92.000	21.4
225			97.000	27.5
275			99.000	33.6
350			100.000	42.7
$D_p = D_d * [(p_d/p_p) * (Solids * C) / 1,000,000]^{1/3}$ <p>where:</p> <p style="margin-left: 100px;"> $p_d = 1 \text{ gm/cm}^3$ $p_p = 2.2 \text{ gm/cm}^3$ </p>				

DP Microns	%Mass Smaller than
10	46.437

H33S - Droplet size distribution



Bethlehem 0.0005%

Droplet Size (μm)	Cumulative Percent Mass
>20	0
20-50	13
50-75	34
75-100	50
100-125	66
125-150	78
150-200	92
200-250	97
250-300	99
300-400	100